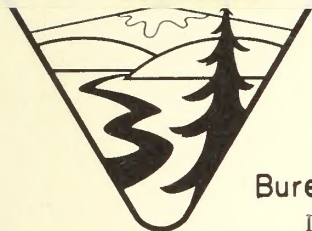


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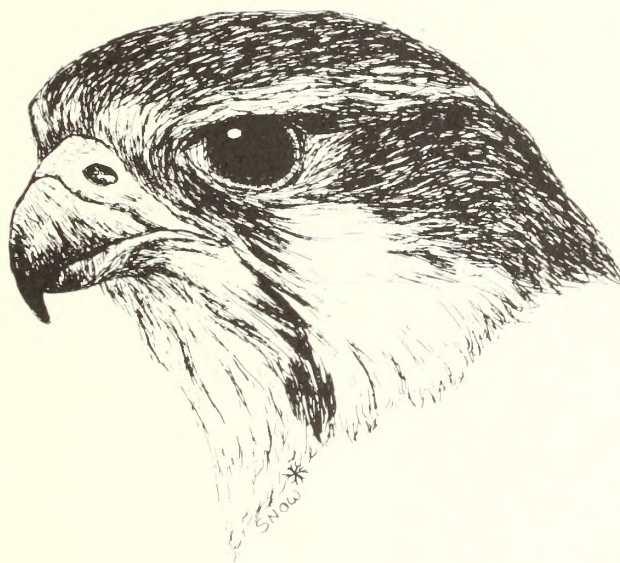
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HABITAT MANAGEMENT SERIES FOR UNIQUE OR ENDANGERED SPECIES

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Report No. 8

Prairie Falcon
Falco mexicanus



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FOREWORD

This Technical Note series on wildlife is designed to provide a literature review and summary of current knowledge pertaining to endangered and other wildlife species occurring on public lands. We in the Bureau of Land Management have recognized the need for basic wildlife information in order to do an effective job in land-use planning. Sound planning must identify the negative aspects as well as the positive benefits of any proposed land management decision or program. It is our hope, too, that this series will also prove useful to others--be they land managers, students, researchers or interested citizens.

Ernst Berklund

Director
Bureau of Land Management
Department of the Interior

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Introduction

The objective of this report is to provide BIM personnel with the latest and most up-to-date information on rare or endangered species occurring on the public domain. This will provide a tool for improved understanding of the interrelationships between the species and its environment and encourage an end product of enlightened land management which will fully consider the species' welfare in all management decisions.

1. Species Description

The prairie falcon, Falco mexicanus, is the most common large falcon in the western United States. Adult prairie falcons are varying shades of brown, from cinnamon to sepia, on the dorsal surface. The feathers of the back, the wing coverts and wings are edged with light amber-brown to buff-white. There is a short light line above the eye, a vague whitish collar on the neck and a whitish diagonal stripe on the sides of the head. This diagonal stripe is separated from the white throat by narrow dark moustachial stripes.

The tail is brown and tipped with white which disappears after wear. The central tail feathers are plain brown and the outer tail feathers are partly barred with buff. The primaries in the wings also have white to buffy bars on the inner webs. The breast and abdomen are creamy white and marked with brown spots which produce a streaked effect. The underwing coverts are also streaked with brown. Eye color is brown and the beak is dark bluish horn. The cere is yellow, as are the legs. Body length is 15 to 18 inches.

Juvenile prairie falcons may be a darker brown than the adults, but tend to be buffy instead of white on their underparts. They are heavily streaked on their flanks, whereas adults tend to be barred. The cere, legs and feet are pale bluish or bluish-gray.

Prairie falcon chicks are covered with a pure white down. The wing and tail feathers appear when the chick is about two weeks old. In the fifth week, growth of the feathers is essentially completed. In fresh plumage at the age of five to six weeks, the young are darker than the adults (Bent, 1938; Brown and Amadon, 1968; Grossman and Hamlet, 1964; Enderson, 1964).

The prairie falcon is similar in size to the peregrine falcon (Falco peregrinus) and the two may be easily confused. Basically, prairie falcons are much lighter in color than peregrine falcons. Another useful field mark is that the prairie

falcon has dark axillary feathers in the "wingpits," which is the base of the underside of the wings. Peregrine falcons do not have this trait (Robbins et al, 1966; Peterson, 1961; Brown and Amadon, 1968; Bent, 1938). When closer examination is possible, the creamy-white line above the eyes in prairie falcons distinguishes them from peregrine falcons (Williams and Matteson, 1947). The exception to this is that immature Arctic peregrines (Falco peregrinus tundrius) have a light line over the eye (Enderson, 1973). See Figure 1.

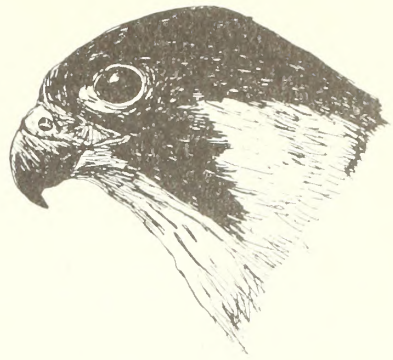
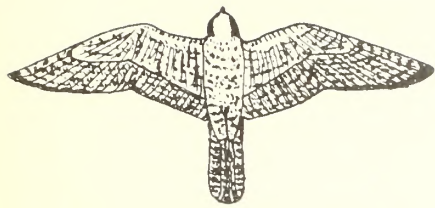
The flight of the prairie falcon is swift and direct, with short, powerful wingbeats. A usual flight pattern is a succession of rapid wingbeats, then a short glide. The wingbeat of the prairie falcon is deeper below the horizontal and scarcely above the horizontal on the upstroke. The peregrine falcon has a deeper wingstroke about equally above and below the horizontal (Bent, 1938; Snow, 1972). The male prairie falcon is noticeably smaller than the female, stockier in appearance and has a larger-appearing head (Enderson, 1964; Brown and Amadon, 1968).

2. Distribution

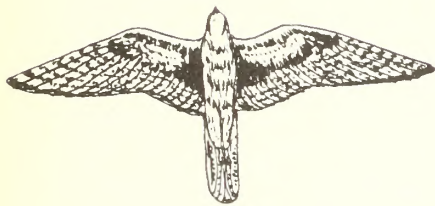
According to the A.O.U. checklist, the prairie falcon breeds from central British Columbia, southern Alberta, southern Saskatchewan and North Dakota south to Baja California, southern Arizona, southern New Mexico and northern Texas. It winters from the northern part of the breeding range south to Mexico.

Enderson (personal communication) has estimated that there are perhaps around 300 pairs in Colorado, less than 300 pairs in New Mexico, 200 pairs in Montana, 200 pairs in Wyoming, and 60-70 pairs in California. In Washington and Oregon prairie falcons are local. Ogden (1973) has observed over 100 pairs in a 45-mile stretch of the Snake River Canyon in Idaho.

Prairie falcons are not common in any area where they may be observed, with the possible exception of the Snake River Birds of Prey Natural Area, which is a unique situation. Enderson (personal communication) has estimated that five to ten percent of the total prairie falcon population in the United States may be located in this canyon.



peregrine falcon



prairie falcon

Figure 1. The peregrine falcon (Falco peregrinus) and the prairie falcon (Falco mexicanus).

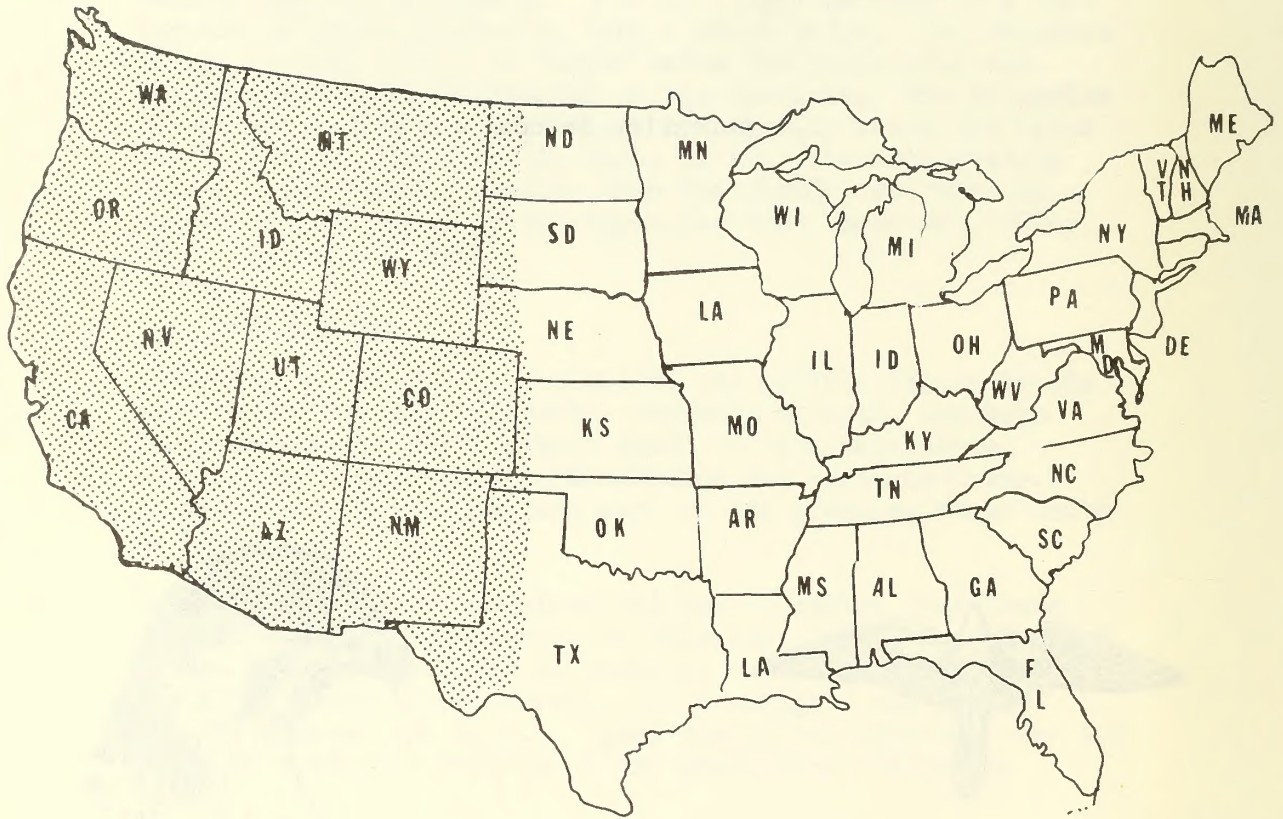


Figure 2. Approximate distribution of the prairie falcon (Falco mexicanus) in the United States.

3. Status and Population Trend

Enderson (personal communication) has estimated the total population of prairie falcons in the United States and Canada to be on the order of 2000 to 2500 pairs. Where habitat is suitable and available, prairie falcons are maintaining a good level of productivity and populations should remain stable.

4. Life History

The prey which prairie falcons will take has some dependence on locality, season and the hunting abilities of the individual falcons (Bent, 1938). Species which the prairie falcon eats include mourning doves, burrowing owls, horned larks, jays, western meadowlarks, blackbirds, shrikes, wrens, pocket gophers, ground squirrels, lark buntings, magpies, sparrows, quail, lizards, grasshoppers, beetles, longspurs, pigeons, cottontail rabbits, and young jackrabbits (Enderson, 1964; Decker and Bowles, 1930; Williams and Matteson, 1947; Bond, 1936b, 1942; Tyler, 1923; Fowler, 1931; Webster, 1944).

The usual hunting method of prairie falcons consists of flying at a moderate altitude of 50 to 300 feet and diving at potential prey (Brown and Amadon, 1968). Much time is spent perching. Bond (1936a) noted that prairie falcons tend to have definite hunting ranges. When food is plentiful these hunting areas are confined to the least possible radius necessary to secure required food supplies.

Prairie falcons seem to prefer capturing prey on or near the ground. They tend to develop prey preferences and will concentrate on a single species or group of species exclusively for as long as possible. When those species have diminished in the falcon's hunting area to the point that too much effort must be expended to capture it, a new prey species is selected and hunted in a like manner (Bond, 1936a).

White (1962) observed prairie falcons exhibiting hunting methods similar to those used by other types of hawks. He watched a prairie falcon in pursuit of starlings drop from a height of 100 feet to a level just above the tops of the sagebrush and fences in the area. Flying rapidly, she passed under several small trees along a fence row. When she emerged, she was directly beneath the starlings. The falcon then flew up into the flock and grabbed at the starlings with both feet. Although she missed the first time, she returned to a perch, carried out the same tactics and was successful the second time. This concealed, low, rapid flight is characteristic of the accipitrine raptors (goshawk (Accipiter gentilis), sharp-shinned hawk (Accipiter striatus) and Cooper's hawk (Accipiter cooperi)).

On another day, White observed a falcon using the typical hunting methods of marsh hawks (Circus cyaneus). It was flying slowly at a very low height above the ground, occasionally hovering above small clumps of brush. This particular prairie falcon was a juvenile.

When a prairie falcon detects likely quarry, such as a small bird, it kills it in the air or on the ground by seizing it with its talons, then biting through the neck vertebrae. The head and part of the neck are crushed and eaten, including some feathers and the beak. Larger birds may be killed in the same way or struck with such force that the talons of the falcon rip through them. Often such quarry is killed by the force of that blow. The neck is frequently broken by the falcon even though the quarry is already dead. The breast muscles, most of the sternum, the lungs, heart and liver are often eaten first. If prey is abundant, these may be the only parts consumed.

Small mammals are killed in the same manner as small birds are killed, although death is usually caused by crushing the skull, then biting through the neck. Larger mammals are dispatched by a series of stoops at the head and neck which are made with so much speed that the talons do not hold. These dives are repeated until the prey is stunned or blinded, skull fractured, or the neck dislocated (Bond, 1936a).

Falcons eat while perched, either on the spot where they have captured their prey or on a convenient vantage point. A feeding falcon is very alert, frequently raising its head and looking around, often watching its surroundings for a minute or so before it continues to eat. When the prey is too heavy to carry, a falcon may chase an intruder and frequently succeed in driving it out of the area. A falcon may also crouch motionless over the prey and remain undetected, flying only at the close approach of other raptors such as rough-legged hawks, marsh hawks or golden eagles (Bond, 1936a; Enderson, 1964).

Prairie falcon pairs do not seem to remain associated with each other during the winter, but move down to lower elevations. They usually return to their eyrie sites in March and go through approximately one month of courtship. Either the male or the female may arrive at the eyrie first, although some observers have thought that the male is usually on the nesting site before the female (Enderson, 1964; Brown and Amadon, 1968; Webster, 1944).

The differences in arrival time at an eyrie suggest that pair formation takes place each year after the return to the breeding grounds (Enderson, 1964; Brown and Amadon, 1968). Just before the eggs are laid, both birds spend much of their time perched near or on the eyrie and the male hunts for both. Copulation is frequent and may occur without any preliminaries (Enderson, 1964; Jaeger, 1948; Brown and Amadon, 1968).

A prairie falcon may lay a clutch of three to six eggs. The average is 4.5 eggs, one egg more than the average clutch size of peregrine falcon eggs. The period of incubation may vary from 29 to 33 days. The young falcons hatch over a period of two to three days, indicating that incubation does not begin with the laying of the first egg (Enderson, 1964; Webster, 1944; Williams and Matteson, 1947). If the first clutch of eggs is taken, prairie falcons frequently lay a second clutch within 20-25 days (Bent, 1938; Tyler, 1923).

Egg dates recorded by Bent (1938) varied. In California, the time of laying (134 records) was March 1 to May 25, with 67 of these records being noted from April 6-15. In Washington and Oregon, 16 records were listed from March 25-April 28. Eight of these occurred from April 5-14. In Montana and Wyoming, 14 records were noted from April 25-June 10, with seven of these occurring from May 4-19. Enderson (1964) observed that clutch completion occurred on the average around April 25 in southern Wyoming and northern Colorado. Some pairs were about one month out of phase with other pairs in the same region.

The female does most of the incubation. Males have been observed to incubate while the female ate prey which the male had brought to the eyrie. The female will often sit tight on the eggs when a human intruder approaches, flattening down and watching the intruder's actions. She frequently will fly from the nest only at the last moment (Enderson, 1964; Decker and Bowles, 1930; Brown and Amadon, 1968).

When falcons incubate their eggs and brood young chicks, they slide their feet under them. If a falcon is startled and leaps up suddenly, the eggs and the young are often tossed out of the nest. The falcon may have difficulty gathering them back into the nest because when she is around the eggs or the young, she walks with closed toes and cannot grasp them with her feet. It is advisable for observers approaching a known eyrie to be sure that the incubating falcon can see their approach and be able to stand up before leaving the nest. Falcons do not seem to associate human sounds with human beings and being noisy upon approach is insufficient warning (Fyfe, personal communication).

The female is very attentive to the young birds and will seldom leave the nest unless an observable intruder is close. Then she will scream and stoop and is fully capable of killing other raptors. The male is more aggressive but the female is more persistent in nest defense. Some falcons have struck human observers. The female feeds and broods the young during the first three-fifths of the time they are in the nest after hatching (Enderson, 1964; Bond, 1936a; Brown and Amadon, 1938; Williams and Matteson, 1947; Decker and Bowles, 1930).

Ground squirrels and medium-sized birds are the most frequent items fed to young falcons. A high percentage of the birds brought to the growing falcons are the young of other species which have recently fledged. Falcons have been observed to remove old prey remains from the nest (Ogden, 1973; Fowler, 1931; Brown and Amadon, 1968; Webster, 1944).

The fledging period is about 40 days long. Fledging success appears to be fairly high. Ogden (1973) observed an average clutch size of 4.4 eggs in Idaho and a fledging success of 3.1 young per eyrie. Olendorff (1973) noted an average clutch size of 4.42 and a fledging success of 3.42 per eyrie on the Pawnee National Grasslands in Colorado.

In his study in Idaho, Ogden (1973) observed that 81 out of 300 eggs were lost before hatching. Twenty-four percent of the eggs disappeared, 30% were infertile, 24% were taken by predators, 11% were lost through accidental breakage and 11% were addled. Nestling losses included the mortality of runts in large broods, predation by bobcats and coyotes, disease and interspecific conflict. The causes of egg losses and nestling mortality were largely unknown in Enderson's Wyoming-Colorado study (Enderson, 1964). Over the three-year period of his study, fledging success was 1.2 young per pair, which is considerably lower than any other study since then. However, it is possible that falconers from the East Coast and the Midwest were taking young falcons from the nests. This period is when falconers in these areas first discovered the value of prairie falcons for falconry and before any regulations had been established for taking these birds (Enderson, pers. comm.).

Shooting is apparently a common cause of mortality, especially among juveniles, who seem less wary than adults. Band recovery data examined by Enderson (1969) showed that 41 of 61 immatures recovered and 9 of 20 adults had been shot. Mortality rates of young prairie falcons may be as high as 74% in the first year, although there are many biases in band returns, including loss of bands from the birds. Adult mortality may be as high as 25%. The inexperience of juvenile birds at successfully providing for themselves may increase their mortality rates.

There seems to be a tendency for young falcons in Wyoming and Colorado to move eastward from mountainous areas to the plains. There are concentrations of both adult and juvenile falcons on the plains in the winter. The juveniles wander more than the adults. The latter appear to establish winter territories. Two factors seem to be involved in the seasonal distribution of prairie falcons: suitable hunting terrain and abundant prey. The horned lark is the main winter food item for prairie falcons in winter wheat areas. The larks arrive around November and are soon followed by the falcons. When the larks disperse the following spring, the falcons have usually begun moving back to their breeding territories (Ender-son, 1964). Other than local movements down to lower elevations, prairie falcons tend to be resident in their range (Bent, 1938).

The voice of the prairie falcon is similar to that of the kestrel, but louder. The alarm call is a rapid, hoarse 'crac, crac, crac.' Mates communicate with a whining 'kruk' (Enderson, 1973).

Experiments conducted by personnel of the Bureau of Sport Fisheries and Wildlife at the Patuxent laboratories with kes-trels (Falco sparverius) have shown that sublethal amounts of chlorinated hydrocarbons can affect reproductive success and result in eggshell thinning (Porter, 1969). Because prairie falcon populations were showing declines in some areas, e.g. California, studies were made of the possible influence of organochlorine insecticides.

Enderson and Berger (1970) experimentally introduced dieldrin and DDE to prairie falcons in Colorado and Wyoming in 1967 and 1968. Their data showed that high DDE residues in egg contents, eggshell thinning and pronounced hatching failure were cor-related.

They fed dieldrin to wild nesting female falcons by tethering contaminated starlings in sight of the falcons. Some females consumed as many as 12 starlings within six weeks before egg laying. One egg per clutch was collected for analysis and subcutaneous fat was taken in a biopsy from the females. Dieldrin levels in the fat of wild falcons fed contaminated starlings averaged eight times the levels in untreated wild falcons. Dieldrin in eggs from treated falcons was many times more concentrated than in eggs from untreated falcons and a significant reduction in eggshell quality was evident. Lockie et al (1969) observed a correlation between eggshell thinning and dieldrin residues in golden eagles in Scotland.

The experimental falcons accumulated high levels of dieldrin in their body fat after ingesting only a few highly contaminated starlings. This ability of a few prey items to radically elevate residue levels may partly explain why residues in wild birds vary greatly where falcons are exposed to prey of differing contamination. Only two eggs in seven clutches which contained over 20 ppm dieldrin hatched.

Fyfe et al (1969) investigated the relationships of organochlorine pesticides and prairie falcon declines in parts of Canada. All egg and tissue samples analyzed contained organochlorine residues, primarily DDE and smaller amounts of heptachlor epoxide and dieldrin. The greater the amount of DDE present, the thinner the eggshell. The shells measured were significantly thinner than the shells of eggs laid before the use of organochlorines began. The lowest production of falcons occurred in the areas where the highest levels of DDE in falcon eggs were observed.

Since a correlation could be shown between the use of organochlorine pesticides and prairie falcon declines, several Canadian government agencies cooperated to reduce the amounts of these pesticides being used. Surveillance by Fyfe (1973a) of the prairie falcon populations has shown that with the decreased use of such pesticides, the amounts of DDE, dieldrin and heptachlor epoxide in the falcons have decreased.

Pesticide levels in prairie falcons have tended to be lower than in peregrine falcons. Prairie falcons are not as migratory as peregrines, and exposure to pesticides is reduced. Small mammals comprise a larger portion of the basic prairie falcon diet and the food chain is shorter, contributing to a lower intake of pesticide residues than for peregrines. Enderson (pers. comm.) has data which indicate that prairie falcon eggshells are thicker and DDE residues lower than they were five years ago, but the sample of eggs collected is small and statistical validity cannot be attached to this information.

In the United States the prairie falcon is a much more versatile raptor than the peregrine falcon. Prairie falcons will nest almost anywhere that there is a suitable site. They are cold-hardy and very tolerant of arid conditions. The adaptability of their food habits is another factor in their favor. Organochlorine pesticides can affect them, but as long as the ban on use of these chemicals is maintained, the prairie falcon should not become endangered as has the American peregrine falcon (Falco peregrinus anatum).

Limiting factors tend to be restrictive in local situations if at all. The overall prairie falcon population is reproductively healthy and, barring loss of habitat or direct molestation, can tolerate a good deal of human activity.

5. Habitat Requirements

Prairie falcons always nest on cliffs, which may range in height from low rock outcrops of thirty feet to vertical, 400-foot-high cliffs. The apparent ideal cliff has a sheltered ledge which provides the site for the eggs, has gravel or loose material on it for the falcon to make a "scrape" or nest depression, and overlooks at least some treeless country for hunting. They will also nest in potholes or larger caves. Prairie falcons in the Snake River Canyon in Idaho have also been observed to use inactive eagle nests (Hickman, 1971; Williams, 1942; Decker and Bowles, 1930; Enderson, 1964; Webster, 1944; Brown and Amadon, 1968; Bent, 1938).

Of 36 nesting cliffs which Enderson (1964) examined in Colorado and Wyoming, 14 were sandstone, 10 were sedimentary conglomerate, 7 were limestone and 5 were granite. Twenty-two nesting ledges faced south, 5 faced north and 9 faced east or west. Tyler (1923) found that most of the nests which he observed in the San Joaquin Valley, California, had northern exposures and no south-facing ledges were used.

Falcons usually have alternate nesting sites located on the same cliff. They exhibit a tendency to use alternate ledges in succeeding years. Nesting failure does not seem to deter use of the cliff in the following year. Banding returns from Enderson's Wyoming-Colorado study indicated that only slightly more than 50% of the individual nesting falcons returned to the site they used the previous year. Most eyrie sites are located in foothills and open sagebrush areas with suitable rock outcroppings. Occasionally prairie falcons have been observed nesting at altitudes of 10,000 feet, although this is exceptional (Williams, 1942; Enderson, 1964; Webster, 1944; Bent, 1938; Brown and Amadon, 1968).

Data on densities of prairie falcons is scarce. Webster (1944) reported an area of Colorado with a density of 23 pairs in 16 miles of cliffs. In 1972, Ogden (1973) observed a density of 101 pairs on a 45-mile stretch of the Snake River in Idaho. Olendorff (1973) reported a density of 1.4 pairs of prairie falcons per 100 square miles on the Pawnee National Grasslands, northeastern Colorado.

There are many apparently suitable nesting cliffs which are not occupied by prairie falcons. The reasons for this phenomenon are not known (Enderson, pers. comm.).

6. Protective Measures Instituted

a. Legal or Regulatory

1. The prairie falcon is included in the treaty which was signed with Mexico in March, 1972, to protect certain families of birds. In the United States it is a protected bird, with provisions to take prairie falcons for falconry in states which permit the practice of falconry.

b. Captive Rearing

1. Details of captive breeding projects can be obtained from Austing, 1967; Enderson, 1971; and Raptor Research, Vol. 6, No. 1, p. 31-38.
2. In 1971, Thacker estimated that there were 22 prairie falcons in research projects and zoos as of 1970. This does not take into account the number of prairie falcons being used in falconry or the additional prairie falcon breeding projects now in progress, as a number of falconers are making private efforts with falcons on their falconry licenses. Enderson (1973) estimates that there may be 200-300 prairie falcons in captivity.

c. Habitat Protection and Improvement

1. Richard Fyfe in Canada has been working on management techniques for several species of raptors. A successful method which has been devised for prairie falcons is the blasting of potholes into the sides of suitable cliffs. Canadian prairie falcons have been using these new potholes. Peregrine falcons will also use new ledges which have been scraped or blasted into a cliff site. The overall effectiveness of these methods has yet to be determined (Fyfe, 1973b).

d. Reintroduction

1. Reintroduction attempts are being made in Canada (Fyfe, 1973b).

7. Recommended Species and Habitat Management Techniques

Although prairie falcons tend to nest in fairly remote sites, massive development projects are creating problems in some areas. Development along the Front Range of the Rocky Mountains in Colorado has caused desertion of nesting sites. The Snake River Birds of Prey Natural Area in Idaho may contain five to ten percent of the total prairie falcon population in the United States, and measures should be taken to insure that any development programs, such as Desert Land Entry development, do not adversely affect this population. A careful study should be made of the impact of the farming and irrigation of the north rim, which is the area containing the prairie falcon's major food supply, the ground squirrel.

8. Ongoing Research Projects

1. Gerald Craig, raptor biologist with the Colorado Division of Wildlife, and Jack Stoddart are continuing part of the study that Richard Olendorff initiated on the Pawnee National Grasslands on the productivity of prairie falcons.
2. Richard Fyfe and co-workers in Alberta and Saskatchewan are maintaining surveys on prairie falcon populations, surveillance on pesticides, continuing breeding projects and studying the effects of management techniques on prairie falcon populations (Fyfe, 1973b).

9. Authorities

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5. Tom Smylie (New Mexico)
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Tijeras, New Mexico

10. Governmental, Private and International Organizations
Actively Involved With This Species' Welfare

- A. 1. National Audubon Society
950 Third Avenue
New York, New York 10022
2. The major objective of the National Audubon Society is to advance public understanding of our wildlife, its habitat and all natural resources and the relationship of wise use and intelligent treatment to human progress.
3. Alexander Sprunt, IV, Research Director
4. National Audubon has a series of leaflets and charts on birds of prey and has concentrated its efforts for raptors in the area of education and protective legislation. The Society was one of the groups instrumental in pressuring for the designation of the Snake River Birds of Prey Natural Area in Idaho.
- B. 1. Raptor Research Foundation, Inc.
c/o Byron E. Harrell
University of South Dakota
Vermillion, South Dakota 57609
2. The main purpose of the Raptor Research Foundation is to stimulate, coordinate, direct and conduct research in the biology and management of birds of prey, and to promote a better understanding and appreciation of the values of these birds.
3. Byron E. Harrell
4. The Raptor Research Foundation publishes Raptor Research, which often contains information on prairie falcons. The Foundation was one of the sponsors of the Conference on Raptor Conservation Techniques, Colorado State University, Fort Collins, Colorado, March 22-24, 1973, and will be publishing the proceedings of that conference.

- C. 1. Bureau of Land Management
Washington, D. C. 20240
2. The BLM administers approximately sixty percent of the Federally owned lands which are located primarily in the western states. These lands are managed under multiple-use principles, including outdoor recreation, fish and wildlife production, livestock grazing, timber, industrial development, watershed protection and mineral production.
3. Robert J. Smith, Chief, Division of Wildlife
4. The Bureau of Land Management is responsible for habitat management on the Snake River Birds of Prey Natural Area in Idaho. The biologist directly working on management plans is Michael N. Kochert, Boise District, Bureau of Land Management, 230 Collins Road, Boise, Idaho 83702.

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